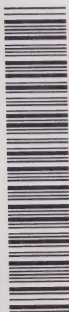


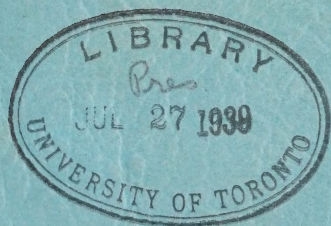
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**The
DOMINION
EXPERIMENTAL
FARMS**




THE DOMINION EXPERIMENTAL FARMS

*A system of experimental stations operated by the Federal
Government which investigates agricultural prob-
lems for the benefit of the Canadian
farmer*



Market lambs on alfalfa pasture at the Central Experimental
Farm, Ottawa

PUBLISHED BY AUTHORITY OF THE
HON. JAMES G. GARDINER, MINISTER OF AGRICULTURE
OTTAWA, 1939



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THE DOMINION EXPERIMENTAL FARMS

THE Dominion Experimental Farms stretch across Canada from the Atlantic to the Pacific ocean, and constitute the most comprehensive system of its kind to be found in the world. The purpose of this little book is to give those who are now farming and those who plan to take up farming in Canada, the briefest outline of its scope and work, and to show that the same assistance, advice and material aid, which have been given to thousands of farmers in the past, are at their disposal at all times and wherever they may make their homes.

History and Development

The preliminary investigations leading to the establishment of the Experimental Farms Branch of the Department of Agriculture began in 1884, when a select committee of the House of Commons was appointed to inquire into the best means of encouraging and developing Canadian agriculture. As a result, Dr. William Saunders, of London, Ont., was instructed, late in 1885, to visit experimental stations in the United States and European countries with a view to formulating a policy for Canada. Following his report to the then Minister of Agriculture, Sir John Carling, an Act was passed for the establishment of an Experimental Farm for the provinces of Ontario and Quebec jointly—this Farm to be known as the Central Farm—together with one for the Maritime Provinces, one for the province of Manitoba, one for the Northwest Territories, and one for British Columbia. The Act cited the main lines of investigation to be pursued. These included live stock breeding, dairying, the testing of cereals and other field crops, grasses and forage plants, fruits, vegetables, trees, and plants; the study of seeds, fertilizers, plant diseases and insect pests, the investigation of diseases of domestic animals, and such other experiments or researches as might benefit agriculture. Within two years of the passing of the Act, the five Farms had been selected, and were in practical operation. They were: The Central Farm at Ottawa, and the Farms at Nappan, Nova Scotia; Brandon, Manitoba; Indian Head, Northwest Territory; and Agassiz, British Columbia.

Past and Present Condition of Canadian Agriculture

At the time of the establishment of the Experimental Farms, the value of good seed and suitable varieties was but little understood, systematic rotations were very little followed, good cultural methods were neither studied nor practised, the use of fertilizers was not fairly understood or systematically followed, the advantages of surface tillage to preserve soil moisture on one hand, and of underdrainage on the other, had not been brought to the

attention of the farmer, the uses of leguminous plants to increase soil fertility were unknown, the necessity of careful breeding, feeding, housing and management of live stock was not recognized—or, in short, agricultural education and practice in the Dominion were in their infancy.

When these facts are realized it will be readily understood how necessary it was that the simple yet fundamentally essential elements leading towards agricultural stimulation should be studied and the results made known as widely as possible. The comparatively advanced state of Canadian agriculture and Canadian agricultural investigations as we have them to-day, is largely due to the patient work upon simple basic problems, as carried on by the pioneer agricultural investigators of the Experimental Farms.

Dr. William Saunders remained Director of the System until March 31, 1911, retiring on account of old age and ill health. On that date the number of Experimental Farms and Stations had increased to nine. He was succeeded as Director by Mr. (later Dr.) J. H. Grisdale, who had been Agriculturist at the Central Farm for some years.

*Rapid
Development
1911 to 1920*

The year 1911 marked the beginning of a more rapid expansion of the Experimental Farms Service.

This was made necessary by the increased settlement in Western Canada and the greater attention being paid to agricultural investigation and effort on the part of various institutions throughout Canada and other countries. During Dr. Grisdale's regime as Director, therefore, several new divisions of the work were established at the Central Farm, and other divisions were subdivided, while the number of Experimental Farms was increased from nine to twenty.

*Recent
Development*

When Dr. Grisdale left the position of Director in March, 1920, to take the higher post of Deputy Minister of the Department of Agriculture, he was succeeded by E. S. Archibald, B.A., B.S.A., LL.D., who had served as Dominion Animal Husbandman under Dr. Grisdale for several years, and for nearly a year had been Acting Director of Experimental Farms in addition.

Since that time, war and post war conditions have not permitted the opening up of new Branch Farms as rapidly as heretofore, only four more Farms having been established, namely at Swift Current and Melfort, Saskatchewan and L'Assomption and Normandin, Quebec, the latter replacing the Station at La Ferme which was closed in 1936, and the Tobacco Stations at Harrow, Ontario, and Farnham, Quebec, raised to the status of Experimental Stations. Other new developments include the opening of the Experimental Fox Ranch, Summerside, P.E.I., the Range Experiment Station at Manyberries, Alta., and the taking over of the two Forest Nursery Stations at Indian Head and Sutherland, Sask. The main efforts of the present Director and his staff have been devoted to systematizing and

broadening the various lines of experimental work, and the equipping of the new Branch Farms for carrying on full lines of investigation. At the present time over 1,500 main experimental projects are being studied on the various Farms and most of these include a number of sub-projects.

THE BRANCH FARMS AND STATIONS

The Experimental Farms Service comprises the Central Experimental Farm at Ottawa, thirty Branch Farms and Stations, some of which carry on special work, ten Sub-stations, seven minor Sub-stations, one hundred and ninety Illustration Stations and forty-seven District Experiment Sub-stations.

Location and Functions of Various Stations

The Experimental Farms and Stations are located as follows: In Prince Edward Island, at Charlottetown; in Nova Scotia, at Nappan and Kentville; in New Brunswick, at Fredericton; in Quebec, at Ste. Anne de la Pocatiere, Cap Rouge, Lennoxville, Farnham, L'Assomption and Normandin; in Ontario, at Kapuskasing and Harrow; in Manitoba, at Brandon and Morden; in Saskatchewan, at Indian Head, Melfort, Rosthern, Scott and Swift Current; in Alberta, at Lacombe and Lethbridge; in British Columbia, at Windermere, Summerland, Agassiz and Saanichton. The purpose of the Branch Farms and Stations is to investigate agricultural problems as they affect the district in which the station is located. They carry on experimental work especially designed to serve the needs of their own immediate constituencies and in addition, have a place in the testing of methods and materials in the broad scheme of agricultural experimentation as it is applied throughout the whole service. In this way, plant originations of all kinds may be given a thorough testing under a wide range of geographical and climatic conditions before they are introduced.

Special Stations

Special stations include the Experimental Fox Ranch at Summerside, P.E.I.; the Horse Breeding Station at St. Joachim, Que.; the Forest Nursery Stations at Indian Head and Sutherland, Sask., and the Range Experiment Station at Manyberries, Alta.

Experimental Sub-stations are located at Ste. Clothilde, Que.; Makamik, Que.; Delhi, Ont.; Fort William, Ont.; Regina, Sask.; Beaverlodge, Alta.; Fort Vermilion, Alta.; Kelowna, B.C.; Tranquille, B.C.; and Smithers, B.C. Minor Sub-stations are situated in the thinly settled areas of the north and are conducted in order to ascertain the northern limits of agricultural production. These are at Harrington Harbour, Que.; Rosthern, Sask.; Fort Providence, Fort Resolution, Fort Smith and Fort Good Hope in the Northwest Territories and at Carcross, Yukon Territory. The Illustration Stations are scattered over the whole country while the District Experiment Sub-stations are confined to the Prairie Provinces and deal with problems connected with prairie farm rehabilitation.

The Divisions At the Central Experimental Farm are located the offices of the Director, as general administrative head of the service, and ten divisions, each under the control and supervision of a divisional chief. The divisions are as follows: Animal Husbandry, Bees, Cereals, Economic Fibre, Field Husbandry, Forage Plants, Horticulture, Illustration Stations, Poultry and Tobacco.

In these divisions originates much of the preliminary work of research and experiment, which is afterwards extended to the branch farms and stations. The results of the work throughout the system in any one line are then collated and made public.

ANIMAL HUSBANDRY DIVISION

To the farmer and prospective settler, the Animal Husbandry Division offers the results of experience acquired through practice and experiment, accruing from the maintenance of approximately 8,000 head of live stock on the Dominion Experimental Farms and Stations in different parts of every province of Canada.

In the studs, herds and flocks of the Dominion Experimental Farms there is represented practically every breed suited to general and special conditions of soil and climate. This selection of breeds has been arrived at only after years of trial. Unsuitable breeds have been eliminated. Desirable breeds have survived and been subject to improvement through the best methods of breeding and management.

*The Place of Live
Stock in the Varying
Types of Canadian
Agriculture*

The next logical step has been the best possible co-ordination of live stock with the various methods of farming in Canada; in the older, central parts; in the great Prairie Provinces; the specialized



Group of Clydesdale stallions, imported from Scotland in 1934 by the Dominion Department of Agriculture and distributed to various Experimental Farms as an aid to horse breeding.

conditions of British Columbia; and lastly, the newly settled frontiers, ever pushing into great areas still to be brought under cultivation.

Aside from advice concerning such matters, there is available an even more direct service to farmers and settlers in the way of the distribution of high-class pure-bred sires, they in turn the progeny of specially selected herds and flocks, and no effort is spared in maintaining the excellence of these breeding centres. Frequent importations are made. Only sires with highly qualified ancestry in breeding and production are purchased and the stock that is offered to the farmer is in turn subject to rigid selection.

Grading Up It must not be inferred that only pure-bred stock is maintained. On the great majority of the Experimental Farms and Stations, work is under way or has been completed, in the grading up of ordinary farm stock by the use of high-class pure-bred sires. Always there is kept uppermost in view, the practical, economical and financial aspects of the industry.

Experimental work is the main function of the division. Every animal, every building, every device, serves two distinct purposes. It is maintained first for its own individual or utilitarian value, and second, for the experimental evidence or data which may be collected through it.

Of the many types of animal husbandry problems being dealt with, the following will indicate the type of work and a few of the results achieved:

Breeding Breed comparisons of cattle are made from the standpoint of suitability and economy of production. In these comparisons the feed requirements and cost of production are being secured and compiled. Feed cost of milk production data are available under a variety of climatic and management conditions.

Comparisons of breeds of sheep are made to determine their usefulness for wool and lamb production under both Western range and Eastern farm conditions.

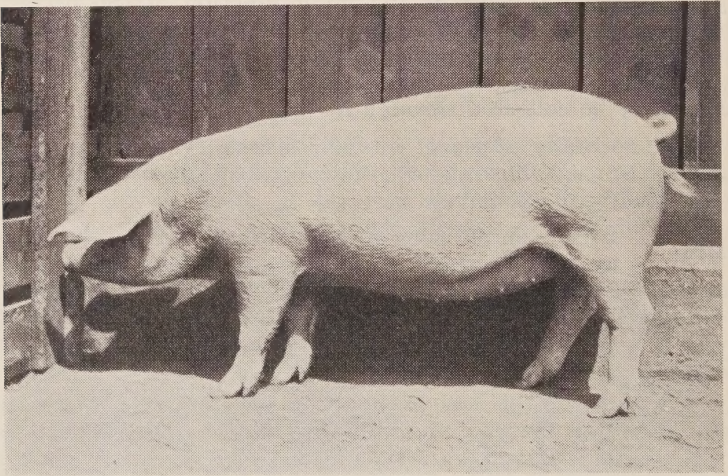
Breeds of swine are evaluated and strains tested to determine their suitability for bacon production.

Studs of breeding horses are maintained, each headed by an outstanding stallion which latter also stands for service of mares of the district at a nominal fee. These studs demonstrate the improvement possible in horse breeding through the use of superior animals, and supply the material for a study of horse breeders' problems.

At the Buffalo Park, Wainwright, Alta., animal hybridizing work with domestic cattle and bison is in progress, its object being to evolve a cross combining the hardiness of the buffalo with the meat qualities of domestic cattle.

*Feeding and
Nutritional
Studies*

This work includes experiments with the feeding of live stock, tests of farm-grown feeds—hay crops, ensiled crops, succulent roughages; tests of grain, mill feeds and mill by-products from the standpoint of economy of purchase and production; experiments with variously compounded rations to learn their effect on milk production, in the production of power, of beef and lamb production and in studies of the effect of feeds and feeding on type, quality and carcass formation of market hogs. As a result of such tests, recommendations and advice on the practical feeding of live stock are given through correspondence, personal contact, bulletins, reports and exhibits. Fundamental research studies in animal nutrition are also being conducted. This work is being done in co-operation with the Division of Chemistry, Science Service, and includes the determination of digestibility of Canadian feed stuffs and the factors which affect the same, with a view to properly evaluating Canadian feeds. The work is now being carried on with steers and it is hoped that it may be extended to other classes of live stock.



Landrace bacon hog used in breed test at the Central Experimental Farm, Ottawa. Representatives of this breed, imported from Sweden, are being used in bacon breed comparisons.

*Housing, Equipment
and Disease Control*

Studies are made of the housing of live stock under the varying climatic conditions of Canada, working always toward the type of building of maximum utility and minimum cost, and including tests of live stock building equipment and accessories thereto. The information thus gained has been incorporated in the plans of farm buildings which are distributed free of charge. Live stock hygiene; the effect of cheap housing, exercise, feeds, methods of feeding and management on animal welfare; the practical effect

of common-sense methods of management as applied to prophylaxis or disease prevention; co-operative experiments and trials on different methods of disease control, are all given careful study by the division.

*Farm Manufacture
and Dairying*

Experiments are conducted with the handling, preparation for market, and manufacture on the farm of farm dairy products—milk, butter, cheese; trial and introduction of new varieties of cheese and the origination of new varieties. Co-operative studies are made of certain bacteriological problems such as clean milk production and the comparative effect on quality as shown by the elimination of sources of contamination. Milking machines and other apparatus entering into the production of milk are studied from the bacteriological as well as from the standpoint of mechanical efficiency.

*Reliable
Information*

A vast store of practical and scientific information as well as that gained from experimental work conducted, is available to the farmer, the settler or the student. To this is being added year by year, further facts and figures, the result of experiment as applied to newer fields; suitable breeding methods with the various classes of live stock; feeds and feed mixtures for beef cattle, dairy cattle, horses, sheep and swine; economical practices for the production of live stock and live stock products; suitable housing and equipment; management practices and practical hygiene. Such information is available through publications and through the Superintendent of every Experimental Farm or Station devoted to live stock work.

BEE DIVISION

Although the first apiary of the Experimental Farms Service was established at Brandon, Manitoba, in 1891 and the apiary at Ottawa in 1893, it was not until 1915 that a separate division was created to take care of this particular phase of agricultural endeavour.

Shortly after the division was formed, other apiaries were started at Branch Farms in all of the provinces. There are now 18 branch apiaries, varying in size from five to over one hundred colonies. Not all of these apiaries are used for experimental purposes, the smaller ones, consisting of only a few colonies, are for the purpose of demonstrating modern equipment and modern methods of keeping bees based on the results obtained in the larger experimental apiaries.

The division through this chain of apiaries conducts experimental and research work in queen breeding, swarm control, wintering, colony manipulation and many other phases of practical beekeeping. It is also carrying out extensive projects related to the fermentation, granulation and storage of honey. In addition, certain studies are being made of nectar and pollen secreting plants, and also of the pollens found in honey. It also

examines samples of dead brood and bees for disease, analyses samples of honey, and in many other ways endeavours to assist the beekeeper and to improve the beekeeping industry of Canada.



Three factors are essential for successful wintering; strong colonies of young bees; an abundance of wholesome stores; adequate protection. Snow acts as a protective blanket. Note the natural windbreak at the left and the constructed windbreak in the rear of the apiary.

Breeding

Queen breeding is being conducted chiefly at the Experimental Station, Kapuskasing, Ont., in an endeavour to improve the strain of bees kept by increasing vitality and reducing the swarming instinct. Queens of high production that have shown little or no tendency towards swarming for a period of two or more years, are selected as queen and drone mothers. The young queens as reared are sent to other branch apiaries for testing.

At least four different races of bees are kept in Canada, the Italian race is, however, predominant. Tests of these races are being made at some of the Branch Farm apiaries in order to determine the race most suitable for each producing area of Canada. Italian, Caucasian and Carniolan bees have been well tried at Ottawa over a period of 14 years and here the Italians proved themselves superior to the other two races. The Caucasian bees, however, are excellent honey gatherers, as also are the Carniolans, but the latter race has too great a tendency for swarming.

Swarm Control

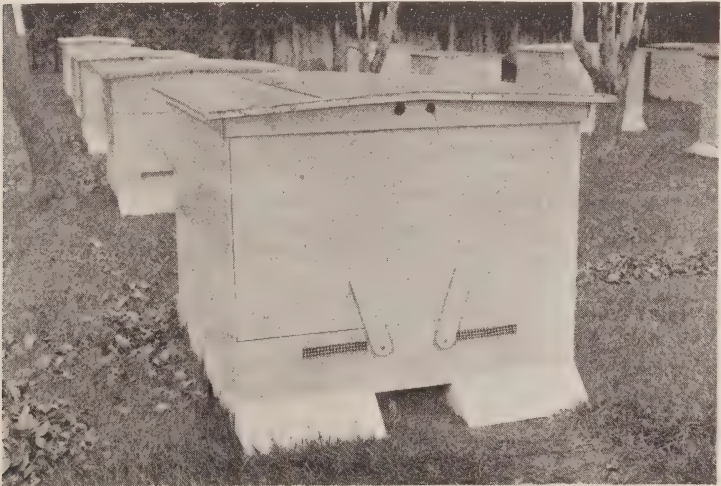
Swarming and honey production are not compatible, therefore, studies are being made of the factors that appear to influence this habit of bees. In spite of preventive measures, however, certain strains of bees are determined to satisfy the swarming instinct in the natural way. To meet such

cases, three satisfactory methods of swarm control have been developed and tested. Two of these methods are now used extensively by commercial beekeepers.

The first definite sign of swarming is the presence of eggs or larvae in queen cells. To find them it was necessary to examine every comb in the colony, considerable time and labour being required. This division, however, has experimented with several methods for detecting swarming preparations without the necessity of examining each comb. One of these methods, the divisible brood chamber, has proved highly efficient and enables the beekeeper to examine at least ten colonies with the same amount of time and labour as required for one colony by the previous method.

Wintering This is one of the greatest problems of Canadian beekeeping. The season during which bees are able to gather supplies is comparatively short, while the winters are long and severe. The average life of the bee during the summer months is approximately six weeks, but in winter their life must be prolonged to at least eight months. To do this requires a careful study of colony strength, food supply and protection in relation to wintering. At one time it was thought that bees could not survive the winter in many parts of Canada unless housed in specially constructed cellars, but the Experimental Farm apiaries have shown that bees can be safely wintered outside in packing cases anywhere in Canada, provided the colonies are properly prepared the previous autumn.

Colony Management Several experiments are included under this heading. In a country so large as Canada one expects to find a great variation in climatic conditions and flora, so



Quadruple wintering cases developed by the Bee Division are collapsible and easy of manipulation. Note the screen over the entrance to prevent mice from gaining access to the colonies.

that a system of management suited to one region may be entirely unsuitable for another. These variations are being studied and the Branch Farm apiaries are engaged in developing systems of management best suited for the regions they serve.

In this connection the honey producing possibilities of the different regions are being studied and new areas are being opened up. It is only a few years ago that beekeeping was thought to be wasted effort in the Prairie Provinces of Canada, but in 1937 the total crop of these provinces exceeded 10 million pounds.

Honey

Due to the enormous increase in honey production, Canadian honey is now being exported to other countries and because of this, honey has to be held in storage for longer periods of time. As honey is a perishable product the question of storage has raised a new problem necessitating extensive studies of its keeping qualities. During the past few years some 800 samples of honey, in duplicate, have been collected by the division from the different producing areas of Canada. One jar of each sample has been placed in storage and periodical examinations made in order to observe and record any changes that may occur during the course of time. The duplicate samples have been submitted to both chemical and microbiological analysis in order to determine the influence of the constituents of the honey on its keeping qualities in storage. A definite relationship between moisture, yeast content and fermentation has been discovered. In connection with this experiment some 300 samples were also secured for controlled temperature tests. The samples were placed under six different temperature conditions of storage. To date those samples stored at temperatures above 60 degrees Fah. have fermented, but those stored at temperatures of 40 and 50 degrees Fah. are still good even after being in storage for $8\frac{1}{2}$ years.

Other Work

Other projects dealing with imported package bees for honey production, orchard pollenization, etc., are being conducted, also work on several phases of apiary management, the testing of hives of various makes, different types of winter cases, honey pollens, etc., is being carried. Extensive experiments for the sterilization of combs infected with American foulbrood, conducted at the Experimental Farm, Brandon, Man., have failed to confirm the claims made for the various chemical treatments advocated.

Bee diseases are diagnosed free of charge. Samples of infected brood sent to the division at Ottawa are microscopically examined, the nature of the infection determined and the beekeeper is then advised as to the best means of eradicating the infection.

Apiary Reminders are issued seasonally to beekeepers on request. Their value lies in discussing briefly matters which will shortly demand attention. Thus the beekeeper is reminded of many things he might otherwise forget, on some of which success or failure may hinge.

Beekeepers in difficulties, who submit their problems are aided by personal advice, and prospective beekeepers are put in touch with those able to supply their requirements.

CEREAL DIVISION

The chief function of the Cereal Division is to obtain for use in all parts of Canada the most profitable varieties of cereal grains, peas, field beans, flax and buckwheat.

The accomplishment of the above task is sought in the following main ways, namely:—

(1) The isolation or creation of superior new varieties or strains of cereal grains, as well as of such crops as peas, beans, and flax.

(2) The testing of new promising varieties or strains of the above crops produced in Canada or introduced from other countries in order that their adaptability for Canadian conditions may be determined.

(3) The production of what is known as "foundation seed" of new promising varieties produced at Ottawa.

(4) The production of Elite Stock seed of registered varieties of the above crops for propagation on a larger scale by the various Branch Experimental Farms or by members of the Canadian Seed Growers' Association.

(5) Assisting in the work of verifying the genuineness and purity of seed stocks submitted for the purpose by the Canadian Seed Growers' Association.

(6) The investigation of varieties of grain for which a licence has been applied, in accordance with the requirements of the Canada Seeds Act.

(7) The investigation of new promising varieties submitted by private plant breeders, farmers, seedsmen or others.

(8) The identification of varieties submitted by farmers or others for that purpose.

(9) The classification and description of cereal varieties in order that these may be more easily distinguished from each other.

(10) The encouragement of the use of good seed and good farming practices, by means of exhibits, press articles and public addresses.

(11) The investigation of various problems having a bearing on cereal breeding and development work, such as:

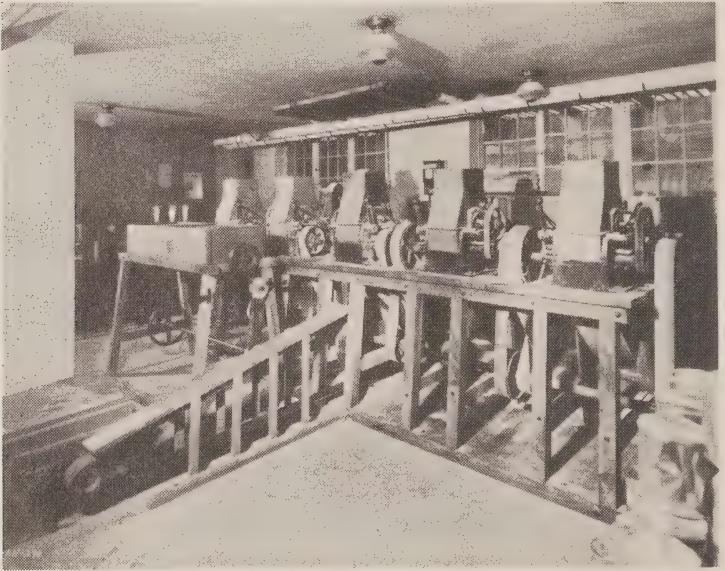
(a) The mode of inheritance of certain characters or qualities which are involved in the production of improved varieties.

(b) The response to environment of different varieties of wheat in respect of milling and baking qualities.

(c) The effect upon the boiling qualities of different varieties of field peas when grown under different soil and climatic conditions.

- (d) The character of Canadian wheat imported into Great Britain and to the Continent, as regards varietal composition and baking quality.
- (e) Methods of field technique designed to ensure the most reliable data.
- (f) The malting qualities of different varieties of barley.

The existence of permanent Branch Farms or Stations in every province in Canada permits not only the methodical prosecution of the above work, but provides farmers in the different provinces with sources of valuable information regarding various phases of crop production.



Experimental mill where new varieties of wheat are tested for milling and baking quality.

*Experimental
Farms as
Seed
Centres*

In addition to carrying on work in producing and proving superior sorts for different regions, the policy has been adopted of making each Branch Farm a seed-producing centre, as far as possible.

Each Farm sows a good many acres of cereal grain each spring, either with Elite Stock seed or with the progeny of this seed which latter is known as Registered seed. The fields are inspected during the growing season by official inspectors operating under the "Seeds Act" of Canada and all fields found to be free from impurities and otherwise desirable, receive certificates of registration from the Canadian Seed Growers' Association. The threshed grain is cleaned thoroughly and again inspected by the above officials. If the grain is up to

standard, not only in purity and quality, but in per cent germination, it receives officially the grade called **Registered**. All sacks containing Registered seed are sewn, tagged with special tags and sealed by an official seed inspector. This seed is then ready for sale at reasonable prices.

At some of the Stations special seed-cleaning machinery designed to clean seed rapidly and thoroughly has been installed and such Stations offer their services to farmers who wish to have their seed cleaned and graded. This service is performed at cost, which amounts to only a few cents per bushel. It is desired that every Branch Farm become the nucleus of a seed-producing centre composed of several farmers in the surrounding district who will produce Registered seed, have it cleaned at the Station cleaning-plants and made available for sale to the general public. The value to the country of these sources of supply of guaranteed seed of approved varieties of high vitality and free from weed seeds can hardly be estimated.



Greenhouses used by the Cereal Division to facilitate breeding work with grains.

Probably the most important work at present under way by the Cereal Division is that being carried on at the Rust Research Laboratory at Winnipeg, where the work of producing new rust-resisting varieties of wheat is largely concentrated. Here is to be found a body of highly trained specialists who are conducting breeding operations on a very extensive scale, and in connection with which work they are co-operating closely with plant pathologists. Work of this nature is naturally highly involved and therefore requires the greatest concentration of effort and efficiency of training.

FIBRE DIVISION

The Division of Economic Fibre Production was organized in 1915, in order to promote the growing of fibre plants in Canada. While the work thus far has been confined largely to investigations in connection with the growing of flax and preparing the fibre and seed for market, nevertheless experiments have been carried on with all manner and types of fibre plants in order to determine their suitability for Canadian conditions.

In a country so large as Canada with its great range of climatic and soil conditions, it is natural to suppose that there are localities particularly suited for the growing of fibre crops. In order to determine where the best flax will grow in the Dominion, the division sows a small acreage of flax at the Branch Farms located in the various provinces. The straw from these small plots is either shipped to the flax mill at the Central Experimental Farm where it is deseeded, retted and scutched, or as in the case of a few Branch Stations, the flax is processed in their own mills.

Demonstration Mills

Having located the districts where the development of the industry appears most suitable, the next step is to demonstrate to the farmers in those localities the best methods of growing, harvesting, retting and scutching the crop. For this purpose small demonstration flax mills are established



Flax pulling machine imported from Belgium by the Fibre Division in 1937.

at various Branch Farms and in some commercial districts in order that the farmers themselves may see the actual operations and receive information regarding the growing, handling and marketing of the crop.

*Marketing the
Fibre and Seed*

At the present time there is only one linen weaving plant in Canada, located in Ontario, but the yarn used in this plant is imported from Ireland because there is no spinning mill for flax fibre operating in Canada, from which yarn might be supplied. Consequently all the fibre flax produced in this country must either be sold in Europe or in the United States. The division has continued to lend valuable assistance to Canadian flax growers in the marketing of both flax fibre and pedigree seed. The market for Canadian pedigree flax seed in Northern Ireland has developed since 1928 and the demand has gradually increased. In addition to this, the future for the production of flax fibre for sale in the Old Country looks particularly bright. From time to time shipments of various classes of Canadian flax fibre have been made in co-operation with the division and the various flax growers throughout Canada. Expert marketing assistance for both fibre and seed has been one of the most important phases of the work of the division.

*Other
Investigations*

In addition to the activities above outlined, the division is carrying on work at Ottawa in testing different varieties of home grown and imported fibre seed with a view to securing varieties that will produce high yields of good quality and of high spinning value. Flax is being sown on different types of soil in order to determine which type will produce the highest yield and the greatest length, strength and quality of fibre. Experiments are being conducted in order to determine the best stage for harvesting flax under Canadian conditions where both seed and fibre are saved. Various tests with artificial fertilizers are in progress for the purpose of ascertaining their influence on yield and quality of fibre and seed and cost of production studies are made in order to find out whether or not the various methods of procedure are economically sound before definite recommendations are made to growers.

The division has recently been equipped with a modern laboratory in which the latest and most scientific methods of plant breeding and plant selection work may be studied. Also, considerable experimental work is being done with respect to the spinning, weaving and dyeing of domestic linens produced in Canada.

FIELD HUSBANDRY DIVISION

To secure reliable information on the most profitable methods of field crop production under various climatic, soil and marketing conditions, the Field Husbandry Division conducts extensive investigations into cropping, cultural, fertilizing, and farm management practices on the different Dominion Experimental Farms throughout Canada. Through the results of these investigations farmers are able to learn what practices are likely to prove most profitable on their farms, as well as those which should be avoided.

Rotations

The results of rotation experiments conducted over a long period of years throughout Eastern Canada, indicate that the best sequence of crops is that which combines the most effective weed control with the greatest economy of tillage operations and which adapts itself to the desired type of farming. Under the semi-arid climate prevailing in the Prairie Provinces, which limits crop production largely to drought resistant grains and grasses, rotation practices centre around the summer-fallow. The essential practice of summer-fallowing for soil moisture conservation was introduced into Western Canada through the Dominion Experimental Farm at Indian Head, Sask., and subsequent experiments have demonstrated the value of this practice for weed control.

Cultivation of the Land

Experiments have shown that shallow ploughing produces as high yields as deep ploughing at a considerable saving in power requirements. Furthermore, tillage beyond that required for weed control and reasonably good seed bed preparation has no beneficial effect on yields. In many districts of the Prairie Provinces, ploughing for summer-fallow has been largely dispensed with in favour of the "ploughless fallow" by surface cultivation. In Eastern Canada, ploughing sod land in the summer with after-harvest cultivation where weeds are troublesome, and ploughing in late fall on less weedy land, have both proved superior to spring ploughing, especially on heavy soils. One advantage of summer or fall ploughing is that they facilitate the early seeding of cereal crops which experiments have clearly shown to be very desirable.



Commercial fertilizers applied in the drill row (left) have given a six-year average yield of 54.0 bushels of barley per acre as compared with 43.0 bushels when applied broadcast.

*Drought and Soil
Drifting in Western
Canada*

In connection with the important problems of drought and soil drifting in the Prairie Provinces, a considerable amount of experimental work is in progress on Dominion Experimental Farms, District Experiment Sub-stations and Reclamation Projects. The adverse effects of drought are offset to some extent by suitable rotations and by summer-fallow practices which result in the maximum conservation of soil moisture. Soil drifting has been successfully controlled in many districts by the practice of strip farming and the adoption of improved methods of surface cultivation.

*Manures and
Fertilizers*

It has been shown that soil fertility in Eastern Canada can be satisfactorily maintained by the judicious use of farmyard manure. Where adequate supplies of manure are not available, however, the use of commercial fertilizers may prove advisable. At the Central Experimental Farm, Ottawa, in a rotation of mangels, oats, clover, and timothy, the yield of mangels on land which has received no manure for 26 years has averaged only 7.79 tons per acre as compared with 22.57 tons on manured land and 20.90 tons on fertilized land.

In recent years a large number of experiments have been conducted to learn the best method of applying fertilizer for various crops. Drilling 100 pounds of a complete fertilizer in contact with the seed has given approximately the same increase in the yields of wheat, oats, and barley as has broadcasting the fertilizer at 200 pounds per acre. With corn, mangels, and potatoes, however, best results have been secured by applying the fertilizer in narrow bands on both sides of the seed, but separated therefrom by about two inches of soil. In the Prairie Provinces, where soil moisture is the chief limiting factor in crop production, the chief value of fertilizer is to hasten the early development of grain crops. For this purpose small applications of concentrated fertilizer drilled in with the seed have given good results.

*Weed
Eradication*

The loss to Canadian farmers which may be credited to weeds is impossible to estimate, but must amount annually to approximately 70 millions of dollars. To learn the most effective and least expensive methods of weed eradication, many experiments are in progress.

Successful eradication of annual weeds, which reproduce by seeds alone, depends largely on preventing the formation of seed which would reinfest the soil. The thorough cultivation and hoeing of row crops and the judicious harrowing of young grain crops are effective cultural methods of weed control. Seeding grain at somewhat higher than normal rates has resulted in some reduction in weed growth by competition. Spraying with a three per cent solution of copper sulphate will completely kill mustard growing in grain with no appreciable injury to the crop. Chemical dusts also offer a very promising method of weed control.



Where couch grass is prevalent, land should be ploughed in the summer and cultivated throughout the fall. This treatment (right) has given a six-year average yield of 14·75 tons of corn per acre as compared with spring ploughing (left) of 10·19 tons.

The control of perennial weeds which reproduce from both seeds and rootstalks has been extensively studied. After-harvest cultivation is probably the most effective method of eradicating these weeds. Growing intertilled crops for two years in succession has also proved beneficial. Spraying small areas with chlorate sprays will kill most perennial weeds. This method, however, is too costly for large areas.

An important source of weed infestation is manure containing weed seeds. Experiments have shown that rotting manure from one to three months, depending on the season, will destroy all weed seeds excepting those on the surface of the pile.

Harvesting Experiments Proper harvesting methods are essential in ensuring good quality farm crops. Extensive experiments have been carried on over a long period of years to determine the best and most economical methods of harvesting and storing hay crops and of harvesting grain and silage crops with different types of machinery. Crops successfully ensiled at Ottawa include corn, sunflowers, alfalfa, red clover, alsike, timothy, barley, buckwheat, millet, soybeans, Jerusalem artichoke, and a mixture of oats, peas and vetches. Some of these crops, notably alfalfa, require great care for successful ensiling. Crops which did not make good silage were hemp, kale, mangels, turnips and potatoes. Preservation of ensiled crops by acid treatment, and the improvement of high protein silage by the addition of molasses, has proved quite feasible although at a somewhat increased cost.

Farm Machinery The investment in implements and farm machinery in Canada amounted, in 1931, to \$650,664,000 or 12.4 per cent of the total investment in farm property. In view of the relative importance of farm machinery not only as an investment but also in relation to farming practices, the Field Husbandry Division is conducting experiments with different types of tillage implements, seeding, spraying, fertilizing, harvesting, and drainage machinery in order to learn their relative efficiency, as well as the essential machinery requirements of various types of farming.

The relative cost and suitability of tractor and horse-drawn equipment for various farm enterprises have received considerable attention. In recent years the use of rubber tires on wheel-type tractors has resulted in an appreciable reduction in operating costs, sufficient to make the use of these tires an economical practice.

Drainage and Irrigation The installation of various drainage systems on many Dominion Experimental Farms has afforded some opportunity for determining the cost and value of tile drains in improving crop yields under different soil conditions.

In connection with the large acreage of irrigated land in Southern Alberta and in the interior valleys of British Columbia, experiments under irrigation have been in progress for many years on the Dominion Experimental Stations at Lethbridge, Alta., Windermere, B.C., and Summerland, B.C. The results of this work are of great value to farmers in the surrounding district, as well as in Saskatchewan where considerable irrigation development is in progress under the Prairie Farm Rehabilitation Act.

Pasture and Range Studies In Eastern Canada there are over 12,000,000 acres of pasture of which nearly 6,000,000 acres are on unimproved land. The best utilization of permanent pasture land requires careful management to ensure the correct intensity of grazing, the removal of coarse, unpalatable herbage, the suppression of brush and weeds, and the provision of supplementary feed at certain periods of the season. Rotative grazing of pasture land has resulted in some increase in carrying capacity, but this gain is offset by the cost of constructing additional fences and watering facilities. The judicious application of fertilizers has produced economical increases in the growth of herbage on many pastures. On pastures which can be ploughed and seeded to cultivated grazing crops, decided increases in production over native pasture herbage may be secured in many regions.

The improvement of grazing conditions on some 36,000,000 acres of range land in Western Canada is the object of large scale experimental work on the Dominion Range Experiment Station at Manyberries, Alta., and at Kamloops, B.C.

Soil Survey

With the object of determining the nature, extent and location of various types of soil throughout Canada, soil surveys are in progress in all provinces excepting Prince Edward Island. This work is conducted in co-operation with the Soils Department of the various Provincial Governments.

Soil Moisture Investigations

Profitable crop production on the Canadian Prairies depends to a very considerable extent on the economical utilization of the limited supply of moisture. The Field Husbandry Division has conducted for many years, a series of experiments on the Dominion Experimental Station, Swift Current, Sask., to determine the fundamental relationship between soil moisture and crop growth. These experiments have definitely shown that the essential feature of summer-fallowing is the destruction of moisture consuming weeds, and that the cultivated soil mulch is of little value in conserving soil moisture. Many experiments are being conducted in order to learn the best methods of conserving moisture including different summer-fallowing methods, basin listing, contour furrowing and terracing.

Cost of Production Studies

Through data secured from field experiments conducted throughout many years, the division has collected considerable information on the cost of producing various crops. Profitable crop production depends largely on keeping labour charges at a minimum, producing large yields and on growing those crops which under local conditions have the highest market value per acre.

Meteorological Records

Careful records are secured on all the Dominion Experimental Farms of temperature, rainfall, sunshine, and other meteorological conditions. These records supply valuable information regarding the effect of climatic conditions on crop growth in various districts throughout Canada.

DIVISION OF FORAGE PLANTS

The activities of the Division of Forage Plants consist of the testing of grasses, leguminous crops and hoed crops to determine their productiveness and suitability for use in Canada; the selection and breeding of grasses, legumes, corn, field roots and sunflowers; the study of hay and pasture problems; the production of seed and its distribution; special research activities such as plant introduction, plant nutrition, and cytology.

Variety Tests

Extensive tests are carried on to determine the varieties of grasses, clovers, alfalfa, corn, soybeans, sunflowers, field roots and other forage plants that are best suited to the different agricultural zones of Canada. These tests include not only the old established varieties but also new varieties and selections so that information may be available at all times for the guidance of the Canadian farmer as to what types and varieties of forage plants are most suitable and productive in any particular zone. In this connection it is interesting to note the results of two projects having direct

application for practical use. Variety tests of Swede turnips have resulted in the introduction from Europe of the club-root resistant variety, Wilhelmsburger, which is being rapidly multiplied and distributed by the Dominion Experimental Farms in the Maritime Provinces. In variety tests of clovers and alfalfas it has been conclusively proved that the material from some sources was not suitable for use in Canada, owing to lack of winter hardiness. Based upon actual results of growing tests, legislation is being enforced making it possible for the Canadian farmer to readily distinguish between suitable and unsuitable clover and alfalfa seed and so reduce to a minimum the chance of loss of crop through winter-killing.

***Breeding and
Selection***

An extensive program of grass breeding has as its object the production of improved strains for hay, pasture, and turf purposes. The species with which work is carried on are timothy, orchard grass, brome grass, perennial rye, blue grasses, the fescues, bent grasses and millets. A number of improved varieties, including Boon timothy, Parkland brome grass, Grazier western rye, Crown and Empire millets



Seed increase block of Boon timothy, an improved variety resulting from the breeding work carried on by the Division of Forage Plants.

have been developed as the result of this work and have been made available for general distribution. The possibility of developing a large seeded, vigorous growing, drought resistant perennial grass, through crossing various species of grasses (*Agropyron*) with common wheat, is being investigated. Such a grass, if obtained, should be of inestimable value to the dry areas of the West. Breeding work is also in progress with the legume crops, including alfalfa, red clover, sweet clover and white clover. Improved strains of alfalfa have been developed, including a new self-tripping strain for high seed production. A hardy, productive, early red clover variety named Ottawa,

has been selected and established in the Ottawa valley. White clover strains are receiving special attention in connection with pasture investigations. Two lines of coumarin-free white blossom sweet clover have been isolated, and two annual early flowering strains of sweet clover, especially promising for bee pastures, have been developed and distributed for trial. Work in connection with soybeans has resulted in the selection of two early maturing varieties, Mandarin (Ottawa) and Kabott, and seed of both has been multiplied and widely distributed in recent years. Kabott is ten days earlier in maturity than Mandarin and makes possible the growing of soybeans over a more extensive area in Canada than formerly. More recent selections have been developed which are still earlier than Kabott, and seed of these is being increased and made available as rapidly as possible. Hundreas of selfed lines of field corn have been isolated by inbreeding in recent years. The best of these have been combined by crossing, with the object of producing either new varieties or vigorous hybrids to meet the various needs of the wide range of the Canadian climate. Breeding work with mangels and swedes has resulted in the production of two improved varieties, the Tip-top mangel and Acadia swede turnip. Seed of both varieties has been made available for distribution. The possibility of developing varieties of sunflowers possessing seed of high oil content is being investigated.

Hay and Pastures

Special attention is being given to hay and pasture problems. Pasture improvement constitutes one of the major problems in Canadian agriculture. Particular attention is directed to the study of pure species and mixtures of grasses and legumes, their productivity, palatability, nutritive value, aggressiveness, persistence under grazing, and reaction to fertilizer treatments. Annual and supplementary pastures are being compared for midsummer use when the permanent pastures are at their lowest level of production.

Seed Production and Distribution

This phase of work includes the study of seed production methods, the multiplication of new varieties and strains, and the distribution of this seed to farmers through the services provided for the purpose. In recent years the following productions of this division have been accepted for registration by the Canadian Seed Growers' Association: "Ottawa" red clover; "Acadia" swede turnip; "Tip-top" mangel; "Mandarin" (Ottawa) and "Kabott" soybeans; "Parkland" brome grass; "Crown" millet and "Empire" millet.

Special Research Activities

New species and varieties of forage crops are continually being introduced from all parts of the world and tested in an introduction nursery, where their promise either for direct use or for use as breeding material is ascertained. Plant nutritional studies are conducted in the greenhouse during the winter months, the plants being grown under controlled conditions, using nutrient solutions. These studies make it possible to determine suitability of certain varieties to particular



Multiplication block of "Ottawa" red clover, a hardy, semi-perennial strain developed by the Division of Forage Plants.

types of soil, and to associate malnutrition symptoms with the special mineral deficiency under field conditions. In the field of cytology, studies are being made on certain species where fundamental information is required prior to hybridization work.

In addition to the work outlined, the division has perfected a cheap, quick, accurate system of dry matter determination for the purpose of reporting forage crop yields. Experiments are conducted with turf grasses, and information is made available on the various grasses adapted to the different types of lawns. Educational exhibits are frequently prepared, and farmers are given assistance on all phases of forage plant work by means of circulars, bulletins, and private correspondence.

DIVISION OF HORTICULTURE

Horticultural work is carried on at all Branch Farms and Stations but at many it largely consists of variety testing and minor cultural experiments. The main endeavour in horticultural research and experimental work is carried on at the following centres: Experimental Station, Kentville, Nova Scotia, located in the heart of the Annapolis and Cornwallis valleys; Experimental Station, Fredericton, New Brunswick; Experimental Station, Cap Rouge, Quebec; Central Experimental

Farm, Ottawa, Ontario; Experimental Station, Morden, Manitoba; Experimental Station, Rosthern, Saskatchewan; Experimental Station, Summerland, British Columbia, in the Okanagan valley; Experimental Farm, Agassiz, British Columbia, in the Fraser river valley; and the Experimental Station, Sidney, British Columbia, on Vancouver Island; and at the Sub-station for muck soils at Ste. Clothilde, Quebec.

Fruit Breeding A good deal of attention has been paid to the breeding of apples for various parts of Canada. One project has been the creation of hardier sorts for the great Northwest and very cold regions. For this purpose hybrids between the Siberian crab (*Malus baccata*), and commercial sorts have been employed. The work has progressed to the point of sending out a number of "third" crosses for trial. The "first" crosses, *Malus baccata* \times *Malus malus*, were all very small crabs but



Apple trees growing under controlled conditions for the investigation of nutritional problems. In the background is seen the young orchard recently planted at Ottawa.

exhibited a number of very hardy progeny. The "second" crosses, ("first" cross \times *Malus malus*), in reality a first generation back cross, exhibited less hardiness but increased size and quality. Several of these have, however, exhibited sufficient hardiness to warrant the continuation of this line of attack. About one hundred "second" back crosses or "third" crosses have fruited, exhibiting full apple size and commercial quality. Several of these appear to possess more hardiness than the "second" crosses. While this work was started for the Northwest, "third" crosses appear promising as hardier sorts for the main fruit regions.

Other apple breeding work within the hardier varieties of *Malus malus* has also been prosecuted and several very promising introductions are being grown commercially, notably Melba, a

high quality early apple; Joyce, a few weeks later in season; Lobo, of the Wealthy season; Lawfam, a winter sort; and Sandow, a late winter apple of very high quality.

The hybridization of plums, pears, strawberries and raspberries has been undertaken and several promising varieties of each have been introduced. The Experimental Station, Morden, Man., has been active in plum breeding and has introduced a considerable number of promising varieties.

Rootstocks and Tree Building One of the greatest problems facing the fruit industry of Canada to-day is the heavy losses of trees due to bark splitting and crotch injury as a result of frequent severe winters. This division is making a thorough study of the possibility of overcoming much of this by the employment of very hardy rootstocks and hardy frameworks to be top worked to the desired sorts. A comprehensive study of the effects of various known rootstocks, intermediates and tops is being conducted towards this end by all the major Horticultural Stations.

Fertilizer and cultural experiments are being conducted at various points in Quebec, Ontario and Nova Scotia on grower-owned orchards. These include a study of clean cultivation and cover crops versus mulching and a study of mineral ratios best suited to various soil types. In addition, a comprehensive study of the effect of certain excesses and deficiencies is being conducted in the main orchard at Ottawa in connection with the study of root and scion relationships.

Vegetables The testing, breeding and selection of vegetable varieties to suit the various conditions in the country has been a main effort for many years. Early varieties



Vegetable seed plots at the Central Experimental Farm. Testing of varieties is an important part of the work.

of table corn, such as Banting and Dorinny, have been introduced and are used over wide areas as commercial sorts. Earlier ripening tomato varieties such as Abel, Bestal and Globonnie, have been introduced and are finding their place in several regions. The Blackie variety of eggplant; Ruby rhubarb and several varieties of peas, including Bruce, Director, Kootenay, Engress and Tiny, are introductions of the Experimental Farms System.

*Ornamental
Horticulture*

In a comparatively new country like Canada the creation of a satisfactory horticulture has of necessity been of paramount importance. This has involved at all Farms a great deal of variety testing. The Prairie Farms in particular have been very active in this respect and as a result of this many noteworthy trees and shrubs have been brought to the attention of the Canadian public. One of the earliest results was the popularization of the caragana and in recent years the work of the Morden Station in this respect has been of much value.

The origination of ornamental material has largely been confined to a few plants. New varieties of lilacs have been introduced as a result of crossing *Syringa villosa* and *S. reflexa* and these are named as a group *S. × Prestoniae*. Three outstanding varieties of Siberian iris have been named and introduced, namely, Gatineau, Ottawa and Pickanock. Several varieties of ornamental crabs have been originated and a great deal of



The Macoun Memorial Garden at Ottawa, built in memory of the late Dr. Macoun, Dominion Horticulturist.

work has been done with lilies and several varieties, such as, Grace Marshall, Lillian Cummings and Coronation, have attracted much attention. Hardy rose breeding has been carried on at Morden and at Ottawa and several of the hardy bush type have been introduced; among these being the Agnes, now grown internationally.

Cold Storage Low temperature laboratories are operated at Kentville, Ottawa and Summerland. At these centres research in temperatures and varietal relationships, humidities and nutritional effects are being studied. The utilization of controlled atmospheres in connection with the storage of apples and pears has resulted in definite recommendations for commercial application. The quality of McIntosh and Golden Russet apples has been considerably improved by the adoption of a gas mixture of 7 per cent carbon dioxide and 14 per cent oxygen, which may be maintained by a simple system of controlled ventilation. A fully equipped respiration laboratory, is operated in conjunction with this work.

Plant nutrition studies with various horticultural crop plants have been conducted and visual symptoms depicting various forms of malnutrition have been detected and illustrated. This work has also given considerable information in the control of certain physiological disorders due to boron deficiency, for example, brown-heart of turnips; stem cracking of celery; non-development of the curd of the cauliflower; cork and corky core of apples; heart browning of cabbage and scurfiness of tomatoes.

The growing of certain crops in sand cultures in the greenhouse has been studied and given commercial application to carnations, lettuce and chrysanthemums. An automatic feeding device has been installed which enables the growing of these crops in a more satisfactory manner than by the orthodox methods.

Fruit and Vegetable Products Laboratories dealing with this phase of work are operated at Kentville, Nova Scotia; Ottawa, Ontario; and Summerland, British Columbia. The Kentville laboratory has developed equipment and a method for the dehydration of fruits and vegetables which is now used by a number of large commercial plants in Canada, producing high quality products at reduced cost.

The Ottawa laboratory has interested itself in research work and the commercial application of freezing to the preservation of strawberries, raspberries, peas, green beans, corn on the cob, asparagus, spinach and other crops. This laboratory has also perfected a satisfactory and simple method of fruit juice preservation enabling the bottling and holding of cider and other fruit juices for prolonged periods without change.

The Summerland laboratory has developed a method for the processing of sweet cherries as glacé stock and maraschino

stock which has been given extended commercial application, in addition to a considerable effort in dehydration and fruit juice work.

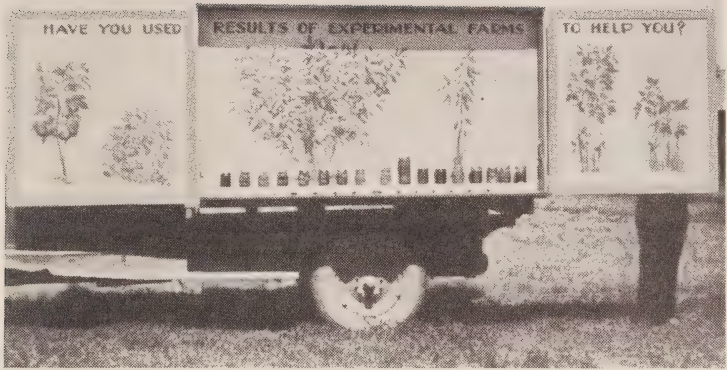
Other Features At Summerland, British Columbia, valuable work in irrigation practices has revealed definite recommendations for the irrigation of such crops as melons and tomatoes. Investigations into the cause of tomato breakdown are in progress at this station. At Agassiz, British Columbia, extensive work to determine the cause of raspberry decline in the Fraser river valley is being undertaken.

At Fredericton, New Brunswick, a very comprehensive potato breeding program is conducted where breeding for disease resistance is the keynote. A large number of hybrid varieties showing considerable resistance to such troubles as mild mosaic and late blight are being tested for their horticultural desirability.

DIVISION OF ILLUSTRATION STATIONS

The object of the Division of Illustration Stations is to serve as a connecting link between the Experimental Farm and the man on the land. These stations are operated on privately owned farms on the basis of a co-operative agreement entered into with the owner and the Dominion Experimental Farms Service. The division was established in 1915, and work undertaken at 29 points within the provinces of Alberta and Saskatchewan. By 1925 the stations numbered 142, and extended to each of the nine provinces. In 1935, after a second decade, there were 223 stations. During that year drought and soil drift problems of the prairies assumed major proportions which required a concerted and aggressive program of direct attack. As a result, the Illustration Stations on the plains area of the West were re-organized and enlarged into what are now named District Experiment Sub-stations, operating under the Prairie Farm Rehabilitation Act. Upon these stations later, strip farming and associate cultural practices, tree planting, water impounding projects and forage crop production became active principles in carrying on the program of work. The present organization of the division comprises 190 Illustration Stations and 47 district Experiment Sub-stations.

Since the inception of the division, the scope of its work has broadened as necessity required, thus has progressed from its original purpose of disseminating the results of experimental data by field and cultural demonstrations, to include outpost crop testing and experiments of a fact-finding nature. Occurring farm problems are studied in their local environment, associated with the more comprehensive research work being carried on at the Experimental Farms. Thus the results of such work are quickly brought to the communities concerned.



Travelling exhibit opened for inspection at an Illustration Station field day in northern Saskatchewan.

*Variability in
Nature of
Activities*

Soil and climatic differences necessitate considerable variation in the nature of the work on the different stations to meet existing conditions. In this connection, 26 types of rotations are under study, with the idea of ascertaining which crops and arrangements of crops will prove best adapted to these farming communities, their effect on weeds, insects, soil drift control and maintenance of soil fertility. Soil fertility considerations come under review and relate to the effect of trace elements, as boron in controlling brown-heart disorders in turnips, value of chemical fertilizers in improving permanent pasture lands, plant food elements and combinations which give the most profitable response in crop growth. These relate to specialized soil problems, as peats and grey wooded soils, as well as specialized crops such as hops, cranberries, and those used in commercial and home canning. There are actually 113 active divisional projects under way, associated with farming problems existing in old and recently settled farming communities.

*Farm Organization
and Management
Studies*

When an Illustration Station is established in a community, a study is made of the existing soil and seasonal factors in their relation to cultural practices, crop and varietal adaptation. Orderly, tidy layout; balanced, well kept fields and practical crops compel attention, and suggest adoption in some particular on the home farm of the observer. One of the first undertakings is to develop a crop improvement program and systematize the work by establishing a rotation adapted to the district and which will provide the necessary feed for the animal units kept. Later, the breeding phase of the work is developed, including the use of pure-bred qualified sires, and from individual milk records, the weeding out of low producing females. On an Illustration

Station the objective is not only to develop an improved herd for the monetary consideration of the owner but eventually to become a source from which neighbours may obtain breeding stock. During the year 1937, station operators disposed of 277 head of cattle, 59 sheep, 353 swine, 995 cockerels, 1,103 pullets and 8,286 sets of hatching eggs.

*Registering Progress
in Quality and
Uniformity of Wheat
Output*

With 90 Stations located in the three Prairie Provinces, the growing of wheat has been a major activity ever since the stations were started. The original plan of cropping for prairie stations was chosen with such foresight that two of the crop sequences included then have not been superseded in general practice. Thus the Illustration Stations afford a continuity of records in wheat production for both yield and cost under the best known cropping plans. Further, with the introduction of the work, the all-important influence of moisture was recognized, and a rain gauge was provided as standard equipment for station operators who were situated where rain was at times inadequate for normal growth. The division now has precipitation and crop records which go back over a number of years, for many localities of the wheat growing plains.

For a number of years the policy has been followed of sowing on the Stations a seed plot of registered wheat as a means of building up the quality and uniformity of seed and the resultant wheat output. This feature exerts a good influence throughout many districts of the wheat producing areas. For the 1937 crop year, 1,466 farmers bought 41,787 bushels of seed from operators of Illustration Stations. Wheat in the sections of Canada where it unmistakably belongs is kept in the foreground of consideration on the Illustration Stations.

*Pioneering in
Legume
Seed Growing*

Pioneer work in the growing of legume seed such as red clover, alsike, sweet clover and alfalfa has been performed by the Illustration Stations in many districts. Not until after the establishment of Illustration Station work 22 years ago was red clover seed produced commercially in the province of Quebec. In 1917 clover was threshed for seed on the stations at Aubrey, Stanbridge East and Ste. Julie. This became more general in Quebec and Eastern Ontario as work expanded to take in new districts. During the intervening period, a study has been made of the necessary cultural practices and red clover seed is now being grown on Illustration Stations, as in the surrounding districts, in the provinces of Quebec, Nova Scotia, New Brunswick, Prince Edward Island and British Columbia.

From Eriksdale in the inter-lake area of Manitoba, the operator has won placings for sweet clover and alfalfa seed at the International Exhibition, Chicago, the Royal Winter Fair, Toronto, and the World's Grain Show, Regina. Prior to the starting of Illustration Station work at Eriksdale in 1926, neither sweet clover nor alfalfa had been grown on the operator's

farm, nor in the district. As a result of forage crop trials carried out in the central interior of British Columbia, alsike and red clover growing for seed have proved well adapted to a number of localities. In 1935 the operator at Salmon Valley, B.C., threshed over 8,000 pounds of alsike clover seed and from the adjoining Prince George district, more than 90 tons of alsike seed were sent into commercial channels.

Orchard Trials

The development of small home orchards is a feature which is being given greater attention in the re-organized setup of the Illustration Stations. The object is to provide, so far as possible within the farm unit, an adequate supply of apples, plums and small fruits for home use. This project, launched in Nova Scotia nine years ago, has proved very successful and a number of the earlier varieties have now come into bearing. A study is being made of the hardiness and adaptation of new varieties resulting from breeding work at Experimental Stations. Useful information has come from this project in the prairie provinces, particularly Manitoba where it has been operating over a longer period than in Saskatchewan and Alberta.

Improvement of Gardens and Home Surroundings

While Illustration Stations are primarily concerned with the problems relating to crop and live stock production, the possibility of developing and maintaining attractive home surroundings and adequate buildings is given consideration. On many Stations shelter belts, hedges, shrubbery, lawns and flower borders are being developed to illustrate what varieties are best suited to the locality and how they can be planted most effectively.

Building plans for the erection of new barns, other buildings and homes as required are discussed with the operators. Improvements such as the laying of concrete floors, improving the lighting of farm buildings and the installation of sheep dipping tanks receive attention. Progress in this direction is evidenced by the fact that in 1932 there were 42 houses and barns painted or whitewashed, 75 in 1933, 78 in 1934, 91 in 1936 and 95 in 1937, on farms operated as Illustration Stations.

Field Days and Co-operative Efforts

A consistent effort has been made to increase the usefulness and service which the Illustration Stations may render in the various communities served. In this connection it is essential that crops grown, methods adopted and results of fact-finding projects pertaining to local problems be brought to the attention of neighbouring farmers. Field days are held on the stations, and where possible organized in co-operation with the local agricultural society or representative. At these meetings details relative to the production of different crops, varieties of grains and grasses grown, preparation of the soil, rates of seeding, etc., are discussed. During 1937 there were 164 meetings held, with a total of 23,482 present, or an average attendance of 143 persons per

meeting. In this way many of the results of the work done on the Experimental Farms and Illustration Stations are brought to the attention of farmers in their own districts.



Neighbouring farmers inspecting the fertilized pastures on the Illustration Station at Buctouche, N.B.

POULTRY DIVISION

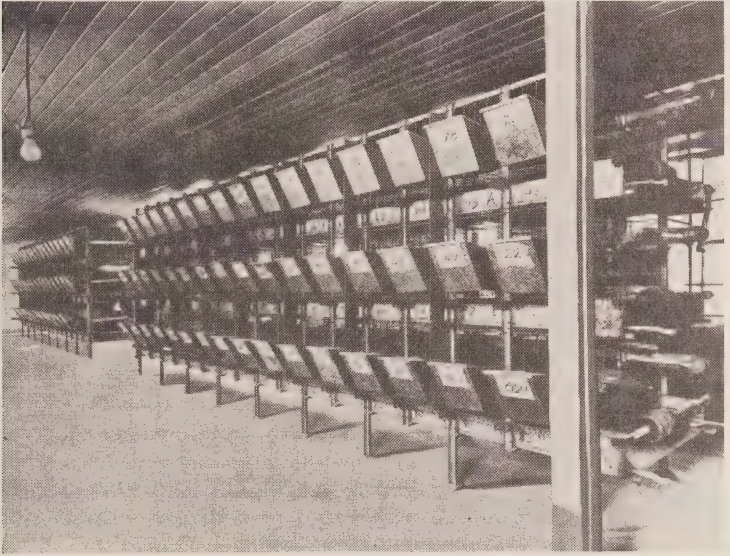
The work of the division embraces fundamental research and experimental work in the various branches of poultry husbandry, including breeding, incubation, brooding, rearing, nutrition, disease and preparation of poultry products for market, both at the Central Farm and upon the various branch farms. In connection with promoting the breeding for increased egg production, Egg Laying Contests come under this division. In co-operation with the Health of Animals Branch work upon poultry disease control is undertaken, with a laboratory in charge of a qualified veterinarian.

Breeding By trapnesting, pedigree breeding, progeny testing and individual and family selection, flocks of high quality poultry of the popular breeds have been built up at Ottawa, and upon the Branch Farms. Particular attention has been given to standard qualities as well as to egg production and egg size, with the result that high producing stock of good type has become the basis for all breeding work. Breeding stock of this quality is yearly distributed among the farmers and poultry keepers of Canada from the different farms, and Illustration Stations at reasonable prices, thus gradually improving the quality of poultry upon Canadian farms.

Research studies into the mode of inheritance of egg size, colour and number of eggs, also on the characters pertaining to type and colour, represent a large part of the work, but fundamental research dealing with studies of sperm fertility and artificial insemination are receiving intensive consideration.

*Incubation
Brooding
and Rearing*

Considerable experimental work is carried on in testing out types of incubators and determining the conditions of temperature, moisture and ventilation, best suited to incubation in different localities. Owing to the great variation in conditions in different sections of Canada, it has been found necessary to vary the methods of operation according to locality and in testing out practices the Branch Farms lend themselves admirably to this work.



A laying battery at the Central Experimental Farm, Ottawa. This equipment is valuable for the carrying out of carefully controlled feeding trials.

Owing to the importance of brooding and rearing chicks and to the many difficulties which may be encountered, experiments upon these subjects receive a great deal of attention. Problems such as the best type of brooding and rearing houses and equipment and the most efficient and economical way of handling chicks under various conditions are investigated. Proper feeding during the brooding period is given especial attention and accounts for extensive experiments.

Nutrition

Nutrition is a major consideration. The feeding of chicks through all the various stages of development, brooding and rearing, egg production, breeding or fattening in preparation for marketing receives the most careful consideration, and study and research is conducted to discover all the ingredients necessary to make up the most satisfactory rations. Feeding trials have shown the absolute necessity for the inclusion of certain vitamins and minerals in the rations and research is constantly being carried on to discover how these may be best and most economically supplied. Balanced rations

are compounded and recommended to those seeking information. It has been demonstrated in a most decisive way that rations that may be satisfactory for laying fowls are very deficient for use on fowls when the eggs are to be used for hatching purposes. It has been shown that most of the home grown grains may be satisfactorily used for fattening but that corn gives the most economical gains. It has also been shown that the efficiency of any grain mixture may be greatly increased by the addition of a small amount of fat to the ration.

Housing The varied climatic conditions found throughout Canada demand poultry houses adaptable to as many conditions as possible with distinct types for certain conditions. Different types of houses have been evolved eminently satisfactory for average Canadian conditions. Slight alterations in plans and equipment to suit local conditions together with numerous innovations as time and experiment dictate, have been responsible for the placing of this work upon a satisfactory basis. Incubator, brooder, laying, breeding, colony and range rearing houses, together with field and house equipment and the most suitable type of litter material are all considered and information is available. It has been demonstrated that in houses that are well built, insulated and sufficiently ventilated without drafts to be dry, it is not necessary to employ artificial heat in order to secure high egg production even in coldest districts.

Canadian National Egg Laying Contests To encourage the breeding for high egg production and to provide a medium for registration a system of egg laying contests has been established, and is administered by this division. These contests are located at Experimental Farms or Stations across Canada, and have done much to stimulate interest in this phase of the industry.

Economics Both at the Central Farm and upon the Branch Farms accurate cost account figures are kept upon all poultry operations, with the result that figures are available for incubation, brooding, rearing, egg production and fattening costs under the varied conditions met with upon the different parts of the system.

Problems of marketing of eggs and stock of all kinds are given due consideration, particularly in so far as preparation for market is concerned. By proper methods of fattening, killing, plucking and dressing of poultry, and by candling, grading and packaging of eggs, encouragement is given to the production of a high quality product. Trials conducted on the Central Farm in the growing, feeding and dressing off of chickens at various weights, of the breeds popular in Canada, demonstrated that these breeds were eminently suited to meet the demands of the British market.



Chickens on range at the Central Experimental Farm.

Disease

A well-equipped pathological laboratory in charge of a staff of qualified veterinarians is responsible for the carrying on of experiments in the control and eradication of poultry diseases. Pullorum disease, intestinal parasitism and diseases of egg production are given special attention and methods of control and eradication of these troubles are recommended.

By following the methods of control and eradication recommended pullorum disease has ceased to be a menace, chick mortality on the Central Farm during recent years being under two per cent. Likewise by following a plan of rotation whereby the chicks are always raised on fresh land each year with an abundance of fresh growing green feed, intestinal parasitism is kept under control and by breeding for vigour and selecting families for viability, mortality in the laying house has been most satisfactorily reduced.

Other Fowl

A waterfowl sanctuary is part of the plant at the Central Farm, where a number of the most popular varieties of domestic geese and ducks are maintained for investigational purposes. Experiments in breeding, feeding and various methods of handling are carried on. In addition to the domestic varieties two breeds of wild geese, Canada and Snow, and one of ducks, Mallards, are kept.

The Canadas are not as prolific as domestic geese, however they breed quite freely under the conditions in which they are kept. The Snows, however, up to the time of their first hatch at the Central Farm, had never before been bred in captivity, in Canada.

The Mallard ducks on the other hand breed very freely and quickly become domesticated. By careful selection and breeding a very uniform flock has been built up and by easy living and high feeding the size has been considerably increased. They are greatly valued for the high quality of their flesh.

Work with turkeys has recently been inaugurated and some work is also done with guinea fowl and pheasants.

General New methods and equipment are constantly being tested, including batteries for brooding, rearing and laying, and rations suitable for battery use have been compounded.

Results of experimental work along the above mentioned lines, including recommendations made, are embodied in the annual reports of the division and of each Branch Farm. Booklets and circulars are also available upon each of the subjects dealt with above. A large amount of correspondence is also handled and is an efficient medium for the discussion of the poultryman's problems.

TOBACCO DIVISION

The primary aim of the division is to make tobacco growing in Canada a remunerative farm enterprise. Special attention is being given to such production problems as breeding for new varieties; testing and introducing promising strains from other countries; soils and fertilizers; cultural methods; harvesting, curing, and warehousing; control of diseases and insects; rotations, crop effects, and cover crops. The five Experimental Stations associated with the Tobacco Division in this program are strategically located in the principal commercial tobacco-growing areas of the Dominion; Harrow and Delhi in Ontario, l'Assomption and Farnham in Quebec, and Summerland in British Columbia.

The industry has expanded and changed considerably since the Tobacco Division was formed in 1906. Thirty years ago production was practically restricted to Burley in Ontario, and to the small and large pipe tobaccos and cigar leaf in Quebec. The greatest progressive change has occurred during the past ten to 15 years, with consumer taste shifting from cigar and pipe smoking to cigarettes. This has entirely transformed the requirements of production. In 1937 at least 75 per cent of the crop was of the bright flue-cured cigarette type. The division supplies reliable information for producing a crop that will fulfil manufacturers' requirements as well as satisfy consumer tastes. This has involved the introduction of new varieties, and improved technique in growing, harvesting, and curing the crop.

The measure of success in improving quality by new and revised cultural technique resulting from planned experiments by the division over a period of years is shown by the fact that

tobacco imports have been reduced from 20 million pounds in 1920 to $2\frac{1}{2}$ million pounds in 1937. Furthermore, during the same period, exports rose from practically nothing to about 10 million pounds. An increasing proportion of Canadian tobacco has been used in domestic manufacture: the Canadian tobacco content of cigarettes, for example, has advanced from less than 30 per cent in 1927 to nearly 75 per cent in 1935. Canadian flue-cured tobacco is generally regarded as the best and most suitable cigarette tobacco grown within the Empire.

*Breeding. Selection
and Plant
Introduction*

Although creation of new varieties by hybridization and selection is usually a slow process, the division has recently been fortunate in developing a Burley variety known as "Harrow Velvet" which is now grown extensively in Western Ontario. In addition to producing a thin, bright leaf, Harrow Velvet is highly resistant to black



The two rows of Harrow Velvet at the left of the picture show the relative resistance of the variety to black root-rot as compared with the old standard sort Judy's Pride shown in the centre, when grown on rot-infested soil. The variety Harrow Velvet was recently developed at the Dominion Experimental Station, Harrow, Ont.

root-rot. In originating better varieties for special conditions, earliness of maturity, resistance to mosaic, and improvement of aroma are characters considered. The improvement of existing varieties by selection is also receiving attention.

Field tests are conducted to ascertain comparative merits of varieties, and to maintain types desired and approved by the tobacco trade. Several varieties new to Canada have been introduced in the past decade. The old flue-cured varieties,

Warne and Hickory Pryor, have now been entirely replaced by such varieties as White Mammoth, Yellow Mammoth, Bonanza, White Stem Orinoco, and Gold Dollar. A resistant cigar variety of acceptable quality, known as "Havana 211", from Wisconsin, is grown on root-rot infested fields in the Montreal areas. All of these varieties are thoroughly tested before they are released and recommended to the growers.

Tobacco Soils and Fertilizers Specific soil types from the various tobacco growing districts have been analysed and classified, and on the basis of this work advice is given to prospective growers. The residual effects of fertilizers in various soils are measured. The application of rapid soil tests in the diagnosis of fertilizer needs on individual tobacco fields is gradually becoming practicable, especially when interpreted in the light of previous crop performance. Mineral deficiencies in soils have been studied, also methods of soil conservation, including the planting of wind-breaks and the maintenance of soil organic matter by rotations and cover crops. Among the particular problems which have received attention are the potash fixing power of various tobacco soil types, and the magnesium requirements of Ontario flue-cured soils.

Extensive experiments on tobacco fertilizers, including the balance of nutrients (nitrogen, phosphorus, and potassium) and sources of materials for the different types of tobacco, have been conducted for the past ten or more years. As a result of these experiments, fertilizer recommendations for the various types of tobacco are drawn up annually and submitted to the fertilizer manufacturers and tobacco growers. Special tobacco fertilizers, meeting these recommendations, are now available and fertilizer practices have been reasonably well standardized for the different tobacco growing districts. In addition to the three principal fertilizer elements, certain minor elements, including magnesium and chlorine, are under test.

Physiological Investigations Physiological and chemical investigations are being conducted in an effort to clarify some of the fundamental relationships involved in the production of high quality tobacco, and include the effects of various fertilizers on the mineral composition of the leaf as well as the effect of varying weather conditions. The changes occurring in the leaf constituents as the result of various cultural practices such as seed-bed management, topping, and suckering, are included in this series of investigations. The progressive development of some of the organic leaf substances through the stages of relative maturity, curing and fermentation, is the object of study, and has revealed the importance of sugars in the cured leaf of flue-cured tobacco. The transformation of starch to sugar during the flue-cured process and the fixation of colour when the sugar content is high, has resulted in improved quality of this type of tobacco.



This excellent field of flue-cured tobacco in the Norfolk area of Ontario, was fertilized with a mixture recommended as a result of field experiments at the Tobacco Sub-station at Delhi, Ont.

*Tobacco Diseases
and Insects*

In co-operation with the Division of Botany, Science Service, extensive research has been in progress with special consideration given to black and brown root-rots, mosaic, and leaf spots. As a result of these investigations diseases in tobacco plant beds and greenhouses have been greatly reduced by soil sterilization and the use of fungicides. Sanitation measures around the seedlings, curing barns, fields and workers using tobacco, reduced the ravages of mosaic under field conditions in Ontario. Tobacco disease surveys and a study of rotations have revealed the importance of previous crop effects on the prevalence of brown root-rot. Tobacco insect pests are also receiving special attention through co-operation with the Division of Entomology.

*Educational
Work*

General field days are held each year at the Stations located in the chief tobacco-growing areas. These provide a channel for the dissemination of practical information resulting from experimental work, and have proved very popular with the growers. Fertilizer and variety demonstration plots located on various farms serve a similar purpose. Definite fertilizer recommendations based on experimental results are prepared at a special Fertilizer Conference, and made available to growers and fertilizer companies each year.

Contact is maintained with the growers by means of correspondence, special winter meetings, and personal interviews at the stations and on the growers' farms. Timely circulars and press articles keep the tobacco producers informed on the most recent improved methods. Reports are published by the Tobacco Division at Ottawa, and by the various Stations. Special bulletins dealing with the industry are published and revised from time to time.

The quarterly publication "The Lighter", issued by the Dominion Tobacco Service, contains information and statistics on the tobacco industry. "Tobacco News", and "La Revue des Tabacs", are sent to interested growers every three months. Close co-operation is maintained with the marketing associations, and also with the Department of Trade and Commerce regarding export possibilities and the requirements of special markets. Assistance is also given through the medium of the tobacco section in the "Agricultural Situation and Outlook" reports.

The growers are informed regarding methods of disease and insect pest control, and some stations render the service of cleaning tobacco seed on request. The division prepares tobacco exhibits for display not only in Canada but for fairs and exhibitions in Great Britain and Europe. Members of the staff present addresses to farmers' organizations and to students in agricultural colleges.

An annual Dominion Tobacco Divisional Conference is held in Ottawa, at which the officials working on tobacco problems meet to discuss difficulties, review experimental results, and, in general, render themselves better able to serve the tobacco growers of Canada.

PRAIRIE FARM REHABILITATION

During recent years, since 1928, unprecedented conditions of drought and soil drifting have caused serious economic losses, through low yields and crop failures, to farmers throughout the open plains of Western Canada. To cope with these conditions, the Dominion Parliament passed in 1935 the Prairie Farm Rehabilitation Act. Under the terms of this Act provision is made for the promotion by the Dominion Department of Agriculture of such systems of crop production, tree culture, water development, and land utilization as will result in the permanent improvement of agriculture in the affected regions. The area covered by the Act comprises some 400,000 square miles, located in southwestern Manitoba, southern Saskatchewan and southeastern Alberta.

Organization of the Rehabilitation Program

The rehabilitation program initiated by the above-mentioned Act covers three broad phases of work: (1) Cultural, (2) Water Development, and (3) Land Utilization.

Cultural work, which includes the trial and demonstration of various improved methods of crop production, soil drifting control, land reclamation, and tree planting, is under the general supervision of the Director of the Dominion Experimental Farms. A fuller description of this work is presented below.

Water development, whereby farmers and ranchers are assisted in constructing dugouts and small dams for the storage of run-off water for domestic, stock-watering, and irrigation purposes, and large dams and irrigation works are constructed for community use, is supervised by the Superintendent of Water Development.

Land utilization work, which involves the permanent withdrawal of sub-marginal land from cultivation and the resettlement of farmers from sub-marginal land on better class soils, is supervised by the Superintendent of Land Utilization. The principal development of this work is the establishment of Community Pastures on abandoned areas of sub-marginal land.

Both the water development and land utilization phases of the rehabilitation program are under the general supervision of the Director of Rehabilitation, with headquarters at Regina, Sask. Reference to these lines of work is made here because of their close relationship to the cultural work.

Organization of Cultural Work under the Rehabilitation Program

The main purpose of the cultural phase of the rehabilitation work is to enable farmers to reduce to a minimum the hazards attaching to crop production under semi-arid conditions, by the most economical utilization of soil moisture and the control of soil drifting. The various agencies through which this objective is being attained are described below, with some reference to the measures being employed and the progress made.

Dominion Experimental Farms Details of cultural work are supervised from the Dominion Experimental Farms located at Brandon, Man.; Indian Head, Sask.; Swift Current, Sask.; Scott, Sask.; and Lethbridge, Alta. As the superintendents of these farms are thoroughly acquainted with agricultural conditions in their respective territories, they are ideally equipped to supervise this work.

District Experiment Sub-Stations Essentially outposts of the Dominion Experimental Farms, these Sub-stations are privately-owned farms operated under government direction to determine and demonstrate the adaptability of various methods of crop production and soil drifting control to local conditions. By the end of March, 1938, some 47 of these Sub-stations had been established, forming an important development of the work of the Division of Illustration Stations.

Operators of District Experiment Sub-stations have been very successful in solving the pressing problem of soil drifting by the adoption of strip farming and the use of suitable tillage methods. Strip farming consists of growing crops in long narrow strips of from 8 to 16 rods wide, running at right angles to the prevailing strong winds, in alternation with similar strips

of summer-fallow. In this manner, the practice of summer-fallowing, indispensable for moisture conservation in semi-arid regions, is retained as part of the farm rotation, while the expanse of bare soil over which the cumulative effect of drifting may be exerted, is reduced to a minimum. In the destruction of weeds on fallow land, and in seed-bed preparation, the tendency to drifting is further reduced by such cultural practices as producing a rough tilth and retaining as much stubble as possible on the surface. The successful demonstration of these practices on the Sub-stations is leading to their adoption in the surrounding districts.

*Reclamation
Projects*

In certain areas where drought and soil drifting have caused the abandonment of farm land, reclamation work of an experimental nature is in progress. The object of this work is to determine the best methods of returning these areas to crop production or of removing their objectionable features as focal points of drifting by establishing a soil binding grass cover. Reclamation stations have been established at Melita, Man., and at Mortlach, Cadillac, Woodrow, Kisbey, Craik and Estevan, in Saskatchewan. Regrassing projects, varying in size from a few to several hundred acres, are located at over 30 points throughout Saskatchewan and Alberta.

*Tree
Planting*

The establishment of farm home and field shelterbelts of trees to afford shelter against the erosive and drying effects of high winds, is an important phase of the rehabilitation program. The most interesting feature of this work is found in the extensive experimental field shelterbelt plantations, each extending over an area equivalent to one township, which are being developed at Lyleton, Man.; Conquest, Sask.; Aneroid, Sask.; and Ribstone, Alta. The object of these plantations is to determine the value of large blocks of shelterbelts for soil moisture conservation and soil drifting control.

During the three years 1935, 1936 and 1937, over 3,000,000 tree seedlings were supplied for rehabilitation purposes from the Dominion Forest Nursery Stations at Indian Head, Sask., and Sutherland, Sask.

*Agricultural
Improvement
Associations*

For the purpose of informing farmers regarding the rehabilitation program, and of encouraging co-ordinated community action on drought and soil drifting problems, Agricultural Improvement Associations have been established at over 100 points in the drought area. The essential characteristic of these associations is that the members agree to adopt certain uniform practices for drought and soil drifting control. In this work the associations receive advisory, financial and material assistance from rehabilitation sources. Many of these associations have done very valuable work, especially in connection with large scale emergency soil drifting control projects.

Research

In connection with the rehabilitation program, a considerable amount of research is in progress. This includes such work as soil surveys, special soil research in co-operation with the three provincial universities, plant breeding at Saskatoon and Swift Current, and a number of investigations at the new Soil Research Laboratory on the Dominion Experimental Station at Swift Current, Sask. These activities are complementary to regular investigational work of the Dominion Experimental Farms.

*Miscellaneous
Activities*

In addition to the foregoing work a variety of rehabilitation projects come under the cultural phase. These include the establishment of pure seed grain production centres throughout the drought area, large scale grass seeding operations, and grass and coverage surveys in ranching areas. An important activity is the large scale soil moisture conservation work started in 1937, involving the construction of terraces and dykes on sloping land, and emergency soil drifting control work on over 150,000 acres of light soil.

CHIEF OFFICERS DOMINION EXPERIMENTAL FARMS

Director.....	E. S. ARCHIBALD, B.A., B.S.A., LL.D., D.Sc.
Associate Director.....	E. S. HOPKINS, B.S.A., M.S., PH.D.
Dominion Animal Husbandman....	G. W. MUIR, B.S.A.
Dominion Apiarist.....	C. B. GOODERHAM, B.S.A.
Dominion Cerealist.....	L. H. NEWMAN, B.S.A., D.Sc.
Dominion Field Husbandman.....	E. S. HOPKINS, PH.D. (acting).
Dominion Agrostologist.....	T. M. STEVENSON, PH.D.
Dominion Poultry Husbandman....	GEORGE ROBERTSON.
Dominion Horticulturist.....	M. B. DAVIS, B.S.A., M.Sc.
Chief, Tobacco Division.....	N. T. NELSON, B.S.A., M.S., PH.D.
Chief Supervisor of Illustration Sta- tions.....	J. C. MOYNAN, B.S.A.
Economic Fibre Specialist.....	R. J. HUTCHINSON.

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Superintendent, Experimental Station, Lethbridge,	W. H. FAIRFIELD, M.Sc., LL.D.
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Superintendent, Experimental Sub-station, Fort Vermilion,	ALBERT LAWRENCE.
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Manitoba

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Superintendent, Experimental Station, Morden,	W. R. LESLIE, B.S.A.

Saskatchewan

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Superintendent, Experimental Station, Rosthern,	F. V. HUTTON, B.S.A.
Superintendent, Experimental Station, Scott,	G. D. MATTHEWS, B.S.A.
Superintendent, Experimental Station, Swift Current,	L. B. THOMSON, B.Sc.
Superintendent, Forest Nursery Station, Indian Head,	N. M. ROSS, B.S.A., B.F.
Superintendent, Forest Nursery Station, Sutherland,	JAMES McLEAN.
Officer-in-Charge, Experimental Sub-station, Regina,	JOHN CAMERON, B.S.A.

New Brunswick

Superintendent, Experimental Station, Fredericton,	C. F. BAILEY, B.S.A.
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Nova Scotia

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Superintendent, Experimental Station, Kentville,	A. KELSALL, B.S.A.

Prince Edward Island

Superintendent, Experimental Station, Charlottetown,	J. A. CLARK, M.S.A., D.Sc.
Superintendent, Experimental Fox Ranch, Summerside,	G. E. SMITH, B.A.Sc.

Ontario

Central Experimental Farm, Ottawa.

Superintendent, Experimental Station, Kapuskasing, S. BALLANTYNE.

Superintendent, Experimental Station, Harrow, H. F. MURWIN, B.S.A.

Officer-in-Charge, Experimental Sub-station, Delhi, F. A. STINSON, B.S.A.

Quebec

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B.S.A.

Superintendent, Experimental Station, Normandin, A. BELZILE, B.S.A.

Superintendent, Experimental Sub-station, Ste. Clothilde de Chateauguay,
F. S. BROWN, B.S.A.

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